International Journal of ChemTech Research
CODEN(USA): IJCRGG ISSN : 0974-4290
Vol.6, No.2, pp 1181-1192, April-June 2014

Minerals, Bioactive Compounds, Antioxidant and Antimicrobial activities of Home remedy Therapeutic Herbal *Scutellaria discolor* (Colebr).

M. Neshwari Devi[1]* & S.R. Singh[2]

[1]Scholar Jodhpur National University, Jodhpur, Rajasthan, [2]HRDRI, Canchipur, Imphal, India.

***Corres.author: hrdri 2008@ gmail.com**

Abstract : *Scutellaria discolor*, a potentially home remedy herbal that traditionally use in prescription in relieving the sprains, cramp, aching, twitching of muscles and in cough fever in Manipur, was tested for exploration on therapeutic organic compounds and antimicrobial activities of herbal extracts. Minerals viz. Potassium (7.7mg/g) Magnesium (7.95 mg/g) phosphorous (0.41mg/g), calcium (0.92 mg/g), sulfur(14.48 mg/g), iron (3.28 mg/g), zinc (0.11 mg/g), copper (0.05 mg/g), manganese(1.3 mg/g), cobalt (nil); Phytorganic compounds of saponin (50 mg/g), tannin (14.3 mg/g), flavonoid (34.72 mg/g), alkaloid (30 mg/g), phenol (43.15 mg/g) and antioxidant (15.5 µg/g) evidence the elite of herbal to traditional knowledge of health care system. screening on antimicrobial activity exhibit ethyl acetate, chloroform and n-butanol extracts of *Scutellaria discolor* substantiated precise antibacterial activity on *Pseudomonas auriginosa, Staphylococcus aureus,* at high degree of concentration while n- butanol acts on *Escherichia coli, Pseudomonas putida;* none of the extracts to *Klebsiella pneumoniae* and all extracts elucidate non – significance outcome to antifungal activity except chloroform extract on *Microsporum gypseum* at high concentration.
Key words: *Scutellaria discolor*, minerals, phytoorganic compounds, antibacterial activity, antifungal activity, therapeutic herbal.

INTRODUCTION

Scutellaria a genus of about 300 species of plants commonly known as *Skullaps*, is widespread in temperate region and on tropical mountain[1]. *Scutellaria discolor* Colebr, (Yenakhat in Manipuri), the official *Scullap*, is an indigenous herb, most widely distributed species in Manipur. It is found growing in shady damp places, meadows, ditches and on the banks of streams particularly in hill slopes covered by vegetation, in shady and in similar situations, flowering in July to September.

The stem of the herb is slender, herbaceous, 4 - angled, much branched, and from 1 to 1.5 feet height, it is smooth violet green when the plant grows in shady situations, but turns brown on exposure to the sun. The leaves are small, from 3 to 5cm long, and about 2.5 as wide, ovate rounded at the base, and acute at the apex. They are smooth, crenate and are borne on opposite leaf- stalks, which are about 2.5cm. The flowers appear late in summer and are borne in numerous, slender, simple, one side racemes, from the axils of the leaves, they are small, opposite and have short pedicles, subtended at the base by small bracts. The calyx is about the length of the pedicel, and has the peculiar helmet shape characteristic of the genes. When fruit is mature, the calyx splits

in the base, the upper lip fatting away, the lower one remaining. The corolla is small, blue, about one mm long, it has a slender, exerted tube, and 2 sub equal lips, the upper is arched, the lower is spreading. The stamens are 4, and included in the corolla. The fruit consists of 4 small metlets.

Scutellaria is used in the treatment of inciting movement of flexion, extension, abduction to emerging associative muscle of flexor, extensor, abductor, through different nerves spreading in all parts of human body. The plant is prescribed to a wide range for stimulating nerve weakness causing perturbation of autonomic nervous system consequent to epilepsy, insomnia, hysteria, anxiety and in relieving sprains, cramp, aching, twitching of muscles and cough fever.

MATERIAL AND METHODS

Material collection

The whole plant of *Scutellaria discolar* was collected in the month of July 2009 from the hill slopes of Uyock ching, Kakching, Thoubal District, Manipur. The plant was authenticated at the Botanical Survey of India (BSI), Shillong. The specimen of the collected material was matching with voucher specimen of the sample and deposited at the HRDRI, Canchipur.

Extraction

After cleaning, they were shade dried and finely powdered in a grinder with utmost care so as not to contaminate with dust. The coarse powder of the dried plant was extracted with petroleum ether, chloroform, ethyl acetate, ethanol, methanol and n- butanol in soxhlet extractor. The concentrated 20µl were examined by TLC on silica gel G chromatoplate.

Test Micro-organisms

Antimicrobial activities of the different extracts of medicinal plant *Scutellaria discolor* Colebr include 5 bacteria: *Escherichia coli* (Gram negative), *Pseudomonas putida* (Gram negative), *Pseudomonas auriginosa* (Gram negative), *Staphylococcus aureus* (Gram positive), *Klebsiella pneumoniae* (Gram negative) 5 fungi; *Aspergillus flavus*, ITCC number [5175], *Aspergillus niger* ITCC number [2146], *Aspergillus fumigatus*, ITCC number [6050], *Candida albicans* ITCC number [3179] and *Microsporum gypseum*, ITCC number [5277]. The microorganisms were chosen based on their chemical and pharmaceutical significance.

Media

Luria bertani agars, Luria bertani broth, potato dextrose agar, trusty products of Hi-media Laboratories, Mumbai (India)etc were appropriately used for the concerned microbes.

Antimicrobial agents

Amphoterecin-B (75µg in 2.5ml of water) and Chloramphenicol (90 µg in 3 ml of MeOH) were used as control for bacteria and fungi respectively.

Antimicrobial activity

Antimicrobial activity was accounted using modified paper disc method [2-5].

The paper disc was prepared by taking aliquots of 1 ml each of the different extracts in the separate eppendorf tubes. The sterilized paper disc prepared from the Whattman paper (diameter of 5.42 mm) was dipped in the different extracts at different concentration for 1hr. After thoroughly wetted the paper discs were incubated in the oven at 45^0C overnight to evaporate the solvent from the paper disc. Approximately 13 ml of nutrient agar poured in each sterilized petri-plate (90mm) for base agar. Cell suspensions with strength of 10^8CFU/ml cells for bacteria and 10^7CFU/ml cells for fungi were prepared. The 24 hrs old broth culture of each bacterium and 3 days old fungus culture were inoculated in previously melted and cooled soft agar (5ml) at about 45- 50^0C. After well mixing the soft agar was poured over the base agar plate and after proper solidification of soft agar, the paper disc previously prepared with its control is placed over the solidified agar plate. Then bacterial plates thus made were incubated at 35^0C for 24hrs and fungal plates at 25^0C for 3 days.

Minimum inhibitory concentration (MIC)

The determination of minimum inhibition concentration (MIC) was carried out by placing the paper discs in increasing or decreasing concentration of the extract over the Petri plate containing soft agar layered over base agar plate [6].

Statistical analysis

The Experimental results were recorded in tabulated form for further in-depth analysis of the research to make coordinating relationship among different extracts, microbial types and concentrations of bioactive etc. All the accorded data of antimicrobial activity have statistically tested and graphically represented to verify the trueness of the findings.

RESULT AND DISCUSSION

The preliminary screening test for secondary metabolites of *Scutellaria discolor* accord phytochemical constituents of tannin, flavonoid, alkaloid, lignan, saponin, cardiac glucoside, terpenoid and no steroids. (Table. A.I.). The precious curative properties of the medicinal plants perhaps those secondary metabolites such as alkaloids, flavonoids, glycosides, phenol, saponin etc are treasured to worthy mankind for virtuous life in the the present investigation. The successive extracts of whole plant extract of *Scutellaria discolor* account the presence of alkaloids, flavonoids, glycosides, phenol, saponin, lignan and anthracene (Table A.I.). Thus, the preliminary screening test focus attention on the detection of the bioactive constituents and subsequently may lead to the drug discovery and development. Over and above these tests facilitate the quantitative separation of those therapeutically active chemical compounds and further indepth examination.

The phytochemical constituents of *Scutellaria discolor* accord saponin 50mg/g, alkaloid 30mg/g, tannin 14.31mg/g, flavonoid 34.72mg/g and phenol 43.15mg/g (table A.III.) A graphical representation of phytochemical contribution is presented in fig.A.II.

The mineral composition of *Scutellaria discolor* accounts potassium 7.7mg/g , magnesium 7.95mg/g, phosphorous 0.416mg/g, Calcium 0.92, sulfur 14.48 mg/g, iron 3.28mg/g, zinc 0.11mg/g, copper 0.05mg/g, manganese 1.3mg/g and cobalt nil table A.IV. A graphical presentation of mineral contribution is represented in fig. A.III.

The present phytochemical test on estimation for antioxidants [7] accord to IC_{50} 15.5µg/ml and confirmed the unique presence of antioxidants and patented in the test herbal *Scutellaria discolor*. A graphical representation is set forth in fig. A.I.

Further, table A.III. depict the phenolic compounds content upto 43.15mg/g in the leaves of *Scutellaria discolor*. The value represented by fig. A.II. vividly show the status among the 5 phytochemical compounds of the plant. Phenol is readily absorbed by all routs, and rapidly distributes throughout the body. Following dermal or inhalation exposure, the half- life of phenol in the human body is approximately 3.5 hours. Unchanged phenol and its metabolic products are primarily excreted in the urine. Phenols have been subjects of extensive research as disease preventives[7,8]. Phenols have been responsible in having the ability to block specific enzymes that causes inflammation. They also modify the prostaglandin pathway and thereby protect platelets from clumping.

The present investigation accounts flavonoid upto 34.72 mg/g. Graphical representation validates the unique feature of the compound (Fig. A.II.). Flavonoids are antioxidants and free radical scavenger which prevent oxidative cells damage, have strong anticancer activity and protect the cell against all stages of carcinogenesis [9,10]. Flavonoid in intestinal - tract lower the risk of heart disease[7]. Flavonoids are potent water-soluble super antioxidant and free radical scavengers which prevent oxidative cell damage, have strong anti-cancer activity and protect against all stages of carcinogenesis [9,10]. They are bioactives against microbes[11].

The present phytochemical test determined the presence of saponin with 50 mg/g (Table A.III). The value represented by graphics vindicate the highest in comparison with other phytochemicals **fig**.A.II. Saponins are glycosidic in nature and have the physical characteristics of producing soapy foam with expectorant action,

which is very useful in the management of inflammatory conditions of the respiratory tract. Saponins present in many plants are cardiotonic and therapeutic in nature[12-14].

Table A.III. illustrated that the alkaloid content ranged upto 30mg/g among the phytoorganic compounds. Graphical representation substantiate the status of the compound among the phytochemicals (fig. A.II.)

The present investigation established the tannin content with 14.31 mg/g (Table A.III.) of the test herbal. The value by graphical representation denotes the specification among the phytochemicals (Fig. A.II.). Tannins inhibit microbial proliferation by denaturation of enzymes involved in microbial metabolism[15]. Tannins also have shown potential antiviral, antibacterial, antiparasitic and anticancer effects[16]. Tannins including gallo and ellagic acid (epigallitannins) are inhibitors of HIV replication. Further, tannins have been found to posses astringent properties which hasten the healing of wounds and inflamed mucous membranes[17]. Tannin have a major impact on nutrition because of their ability to form complexes with numerous types of molecules like carbohydrates, protein polysaccharides and enzymes involved in protein and carbohydrates digestion. Tannin-protein interactions are most frequently based on hydrophobic and hydrogen bonding. Ionic and covalent bonding occurs less frequently. Tannin precipitates with alkaloid gelatin and albumin[18]. More recently allergic acid obtained from ellagitannin and its derivatives have been used for the treatment of cancer patients and the results are promising [19].

Perusal on analysis of results revealed that the fully expanded and older leaves of *Scutellaria discolor* were free resource of phyto organic compounds of saponin, tannin, flavonoid, alkaloids and phenols. The herbal also demonstrate the source of antioxidants with the phytochemicals. Thus it is obvious the therapeutic herbal incorporates with imperative phytochemical key to vital processes of life.The finding was in corroborative with other workers at different places and in different plants.[7,10,20]

Table A.I. Preliminary screening of secondary metabolite of *Scutellaria discolor* (Colebr)

Plant species	**Tanin**	**Flavonoid**	**Alkaloid**	**Steroid**	**Saponin**	**Terpenoid**	**Cardiac glycoside**
Scutellaria discolor	Present	Present	Present	Absent	Present	Present	Present

Table A.II. Qualitative separation for TLC of Lignan, Phenol, Siphonin, Flavonoid, Alkaloid, Glycosides and Anthracene of the *Scutellaria discolor* (Colebr).

Plant species	**Lignan**	**Phenol**	**Saponin**	**Flavonoid**	**Alkaloid**	**Glycoside**	**Anthracene**
hRf	2.0	3.5	2.5	5.0	2.0	2.0	6.0
	7.0	7.5	3.0	8.0(Yellow)	5.0	4.0	8.0
	5.0	0.9		9.0(Blue)	8.0	9.0	9.0
					9.0		

Table A.III. The phytochemical constituents of flavonoid, saponin, alkaloid, phenol, tannin in mg/g and antioxidant in µg/ml of the *Scutellaria discolor* (Colebr).

Plant species	**Antioxidant IC_{50} (µg/ml)**	**Flavonoid**	**Phenol**	**Alkaloid**	**Saponin**	**Tannin**
Scutellaria discolor.	15.5±0.78	34.722 ±1.18	43.15 ±1.31	30±1.09	50±1.41	14.313 ±0.75

Value are expressed as mean ± SEM; n = 3 in triplicate for each data

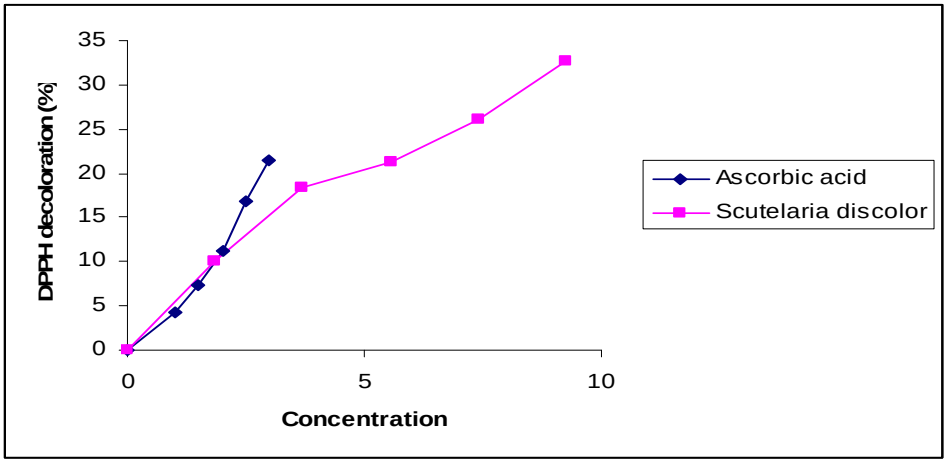

Fig.A.I. DPPH free radical scavenging activity of methanolic extract *Scutelaria discolor* added to methanolic solution of DPPH as compared to standard Ascorbic acid

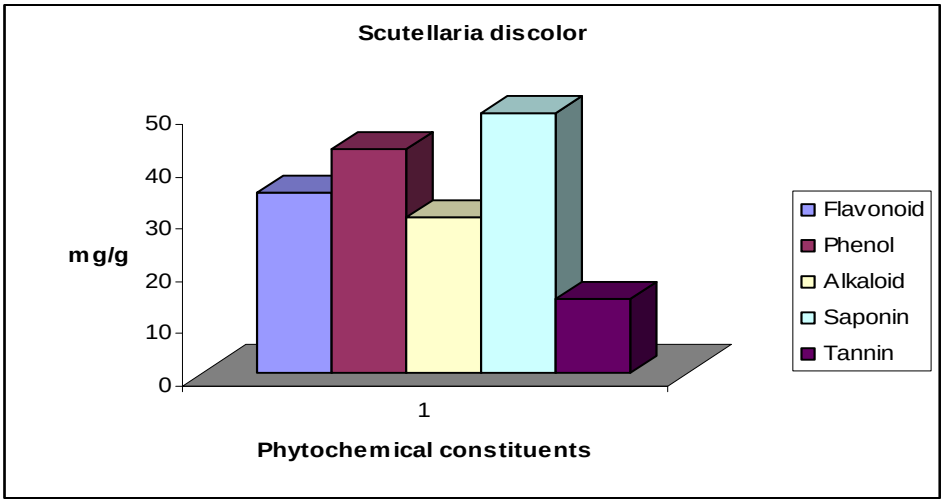

Fig. A.II.-Phytochemical composition of *Scutallaria discolor*

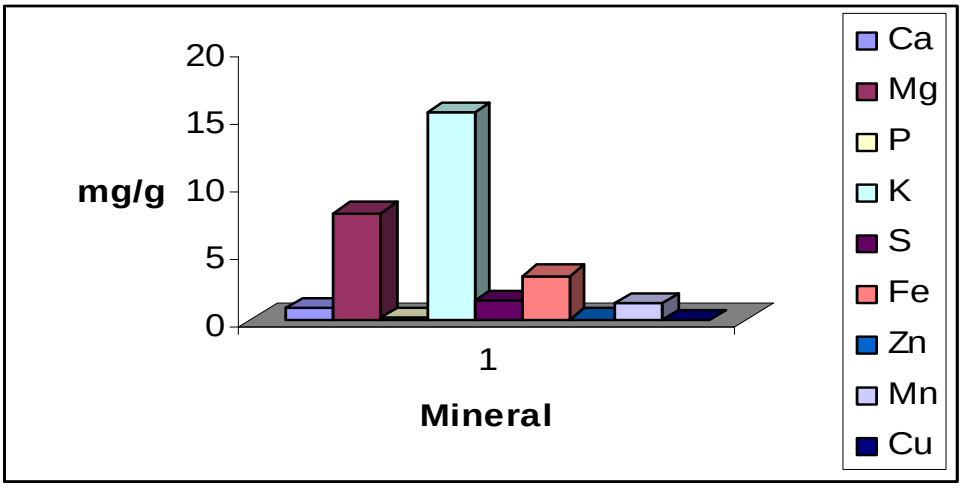

Fig. A.III. Mineral composition of *Scutellaria discolor*

Table A.IV. Composition of mineral elements of *Scutellaria discolors* (Colebr).

Plant species	K	Ca	Mg	P	S	Fe	Zn	Cu	Mn	Co
Scutellaria discolor	7.7 ±0.55	0.92 ±0.19	7.95 ±0.56	0.416 ±0.12	14.48 ±0.76	3.28 ±0.36	0.11 0.06	0.05 ±0.04	1.3 ±0.22	ND

Value are expressed as mean ± SEM; n = 3 in triplicate for each data.

Table A.IV revealed that the *Scutellaria discolor* account for distinct mineral content with remarkable amounts viz. potassium 7.7 mg/g, magnesium 7.95 mg/g, phosphorous 0.416mg/g, iron 3.28mg/g, zinc 0.11 mg/g, copper 0.05mg/g, sulfur 14.48mg/g and manganese 1.3mg/g and cobalt not detected. The values of all the minerals represented by graphics benchmarking among themselves (Fig. A.III.). The result intimate the test herbal is conspicuously typifying resources of life supporting minerals.

Essential elements e.g. Fe, Zn and Mn are important in several enzymatic reactions as co-factors [21]. Iron is important in the production of hemoglobin and plays an important role in flavoprotein-cytochrome system activities hence it is used to treat iron deficiency anaemia[22]. Zn plays vital role in most cells as essential component of enzymes such as carbonic anhydrase, alcohol dehydrogenase, and lactate dehydrogenase, carboxypeptidase's and alanine peptidases. Zinc is very important for nerve function and male fertility.It is important for normal sexual development especially for the development of testes and ovaries, it is also essential for reproduction. Zinc stimulates the activity of vitamins, formation of red and white corpuscles [23], healthy functioning of the heart and normal growth[24]. Manganese is necessary for the functioning of the pituitary gland, the pineal gland and the brain, it promotes hepatorenal function, combat anemia and also essential for growth. Copper is important for cellular defense and protection of the mucous membranes, anti anemic and essential for the formation of Iron and haemoglobin[25]. Calcium vitalize for normal blood clotting; magnesium stimulates the activity of many enzymes and a number of trace elements control the contraction of muscle and the transmission of impulses by nerve cells[26]. Macro elements of Na, K and Ca regulate the fluid balance of the body. The plasma calcium ion concentration regulates a number of important physiological and biochemical processes. High plasma manganese prevents the changes in the plasma Cu plays a role in the utilization of insulin [27].

Manganese apparently absorbed throughout the small intestine, can be adversely affected by other elements such as calcium, phosphorus, and soy protein[28]. Manganese ratify normal thyroid function and count in the formation of thyroxin [29]. The adrenal hormones are known to affect the tissue distribution of manganese as well as to alter its metabolism[30]. Manganese deficiencies including skeletal abnormalities, postural defects, impaired growth, impaired reproductive function, and disturbances in lipid and carbohydrate metabolism[31]. Manganese is involved in cholesterol synthesis and it shows a synergistic relationship with choline. A deficiency of either or both may lead to abnormal mitochondrial and cell membrane integrity. Human manganese deficiency included hypercholesterolemia, decreased triglycerides and phospholipids, weight loss, transient dermatitis, intermittent nausea and hair colour changes from black to red[32]. Manganese toxicity causes manganese psychosis and speech disorders, clumsy movements, abnormal gait, poor balance, hyperreflexia in the lower limbs, fine tremors and rigidity, spasmodic laughter, and mask-like face-all similar to symptoms of Parkinson's disease[33]. The mechanism of manganese neurotoxicity appears to be due to neuronal degeneration in various areas of the brain and abnormalities of neurotransmitters.

Calcium ions plays vital role in neuromuscular excitability, blood coagulation, secretory processes etc.[34]. Proper extracellular fluid and periosteal concentration of calcium and phosphate ions are vibrant for bone mineralization. Elements such as iron, zinc and manganese are indispensable in several enzyme reactions as co-factors[20]. The present finding evident the minerals, phytochemicals including antioxidant invigorate the vital of traditional knowledge of therapeutic herbals through present day technological basis of scientific investigation.

Antibacterial Activities

Ethyl acetate extract of S*cutellaria discolor* accords 5, 7, 10 mm on *E. coli*; and 6,8,11mm on *K. pneumoniae* with 14 mm to their control and 7, 9, 12 mm on *P. putida* with 15 mm in control at different concentrations of 10, 20 and 30mg/ml respectively . The impact of ethyl acetate extract in *P. auriginosa* accord

10, 15, 20mm at 10, 20, 30mg/ml concentration while control accord 15mm; next in *S. aureus*, the MIZ accord 17, 20, 25mm at 10, 20, 30mg/ml concentration while controlled attained 17mm. The accorded record has presented in table B.I. and fig. B.I.

Impact of chloroform extract of S*cutellaria discolor* on the three test bacteria accord 6, 8, 10 mm on *E. coli*, 7, 9, 11 on *K. pneumoniae*, at different concentrations of 10, 20 and 30mg/ml while the control sample suppressed 14mm and 5, 7, 11 on *P. putida* against control suppressed 15mm. Observation on *P. auriginosa*, accord 10, 10, 15mm MIZ at 10, 20 30mg/ml. against 15mm MIZ in control. Similarly in *S. aureus* the MIZ level accord 15,19, 20mm at three different concentration of 10, 20, 30mg/ml while the control accord 17mm.

With n-butanol extract of *Scutellaria discolor*, the MIZ on *E. coli* accord 13, 15, 17mm MIZ at 10, 20, 30mg/ml concentration while the control accord 14mm. Similarly, on *P. putida* the MIZ accord 10, 13,15mm at 10, 20, 30mg/ml while the control attained 15mm; next in *P. auriginosa*, the MIZ accord 15, 15, 20mm at 10, 20, 30mg/ml. against the 15mm control. Similarly in *S. aureus* the MIZ level accord 13,13, 20mm at three different concentration of 10, 20, 30mg/ml. against 17mm in the control. While in test bacteria, *K. pneumoniae* the MIZ accord 6, 8, 10mm at three concentrations of 10,20,30 mg/ml against 14mm in control.

Table B.I. substantiated the low antibacterial activity of ethyl acetate extract of *Scutellaria discolor* on *E. coli*, *P. putida* and *K. pneumoniae* except *P.auriginosa* and *S. aureus* which has high degree inhibition of bacterial growth at high concentration of 30 mg/ml. The finding emphasize the non significant action of the ethyl acetate extract of *Scutellaria discolor* to antibacterial activity on *E. coli*, *P. putida*, *K. pneumoniae* and significance explicit action of *P.auriginosa* and *S. aureus* eventually the associative diseases caused by them. Eventually it is evident the potent of bio-actives in the ethyl acetate extract of *Scutellaria discolor* in elimination of bacterial microbes acts selectively and thereof enhance the utilities in proper management of diseases associated with them.

Table B.I. also demonstrate the antibacterial activity of chloroform extract of *Scutellaria discolor* on *E. coli*, *P. putida*, *K. pneumoniae* and *P. auriginosa* with low inhibition except *S. aureus*. The present finding clarified the selectiveness in antibacterial activity of chloroform extract of *Scutellaria discolor* in activities and effectiveness to test microbes and justified the effectiveness only to *Pseudomonas auriginosa* at high concentration.

Further, table B.I. displayed the n- butanol extract of *Scutellaria discolor* exact with high grade antibacterial activity on *E. coli*, *P. auriginosa* and *S. aureus* by inhibition of bacterial growth at higher concentration except *K. pneumoniae* which indicates the selectiveness of the bioactive activity of the extract. The finding call attention to bio-actives of n-butanol extract of *Scutellaria discolor* which have the potential to subdue *E. coli*, *P. auriginosa* and *S. aureus* significance at 0.05 level. The finding was in agreement with that of the different workers in different places [35, 36].

Antifungal Activities

Ethyl acetate extract of S*cutellaria discolor* accords low suppression 5,7,10; 7,9,13 mm; on *A. flavus A. fumigates* with 20 mm in control and 10, 10, 15, 10, 15,15; 6,8,12 mm on *A. niger, C. albicans M. gypseum* with 25 mm in control at different concentrations of 10, 20 and 30 mg/ml. The accorded record has presented in table B.II. and Fig.B. II.

Chloroform extract of *Scutellaria discolor* reacts on the test fungi of *A. flavus, A. fumigatus* with very low suppression of 7.10,12; 7,9,11mm; against 20 mm in control and 12,14,16; 15,19,20; mm on *A. niger*; *C. albicans* with 25 mm in control at three different concentration of 10, 20 30 mg/ml. However in test fungus *M. gypseum* the MIZ accord 20, 20, 30 mm at 10, 20, 30mg/ml as against 25mm in control.

With n-butanol extract of *Scutellaria discolor* the test fungus react very low suppression on *A. flavus*, *A. fumigatus* which accord 6,8,10; 7,9,13; mm against the control of 20mm and 7,10,12; 10,15,15; 15,15,20mm; on *A. niger*; *C. albicans*, *M. gypseum* respectively against the control of 25 mm at 10, 20, 30mg/ml concentration.

Table B.II. exhibits antifungal activity of the bio-actives of the ethyl acetate extract of S*cutellaria discolor* with very low inhibition to the fungal growth of *Aspergillus flavus, Aspergillus niger, Aspergillus*

fumigatus, and *Microporous gypseum* at all the test concentrations of 10, 20, and 30 mg/ml. Statistically non – significance in t – test is greater than table value i.e.calculated value 4.30 at 0.05 level.

Table B.II. further revealed the impact of antifungal activity of the chloroform extract of *Scutellaria discolor* on *A. flavus, A. fumigatus , A. niger* and *C. albicans* with very low suppression of fungal growth even lower lower than control but expressed high degree suppression of fungal growth on *M. gypseum* only at high degree of concentration 30 mg/ml with comparison to control. The result of the current study connotes the bioactive the chloroform extract of *Scutellaria discolor* have prompt antifungal activity at high concentration to *M. gypseum*, and no significant impact to *A. niger, A. flavus, A. fumigatus* and *C. albicans* .

Table B.II. also depict the antifungal activity of n-butanol extract of *Scutellaria discolor* on *A. flavus, A. niger, A. fumigatus C. albicans* and *M. gypseum.* The result of the study show that the bio-actives of n-butanol extract of *M. gypseum* have very low antifungal activity on *A. flavus, A. niger, A. fumigatus* and low grade antifungal activity on *C. albicans* and *M. gypseum.* In other words, there is no significance in students t-test to the antifungal activity of n-butanol extract of *Scutellaria discolor* to the test fungi of *A. flavus, A. niger, A. fumigatus , C. albicans* and *M. gypseum* with control. The finding highlight the n-butanol extract of *Scutellaria discolor* is not effective to use in controlling all the test fungi. The finding was in concordance with that of the different workers in different plant extracts at different places [37-,40].

Table. B.I. Antibacterial activity (zone of inhibition) of crude extracts and solvent fractions of *Scutellaria discolor(*Colebr*).*

Organisms	*Scutellaria discolor*(10,20,30 mg/ml)				
	Concentration mg/ml	Sample1 (mm)	Sample 2 (mm)	Sample 3 (mm)	Control (mm)
Escherichia coli	10	5±0.44	6±0.44	13±0.72	14±0.75
	20	7±0.51	8±0.56	15±0.77	14±0.75
	30	10±0.63	10±0.63	17±0.82	14±0.75
Pseudomonas putida	10	7±0.51	5±0.44	10±0.63	15±0.77
	20	9±0.59	7±0.51	13±0.72	15±0.77
	30	12±0.69	11±0.65	15±0.77	15±0.77
Pseudomonas auriginosa	10	10±0.63	10±0.63	15±0.77	15±0.77
	20	15±0.77	10±0.63	15±0.77	15±0.77
	30	20±0.89	15±0.77	20±0.89	15±0.77
Staphylococcus aureus	10	17±0.82	15±0.77	13±0.72	17±0.82
	20	20±0.89	19±0.87	13±0.72	17±0.82
	30	25±1.0	20±0.89	20±0.89	17±0.82
Klebsiella pneumoniae	10	6±0.44	7±0.51	6±0.44	14±0.75
	20	8±0.56	9±0.59	8±0.56	14±0.75
	30	11±0.65	11±0.65	10±0.63	14±0.75

Values are expressed as mean ± SEM; n = 3 in replicate for each treatment.
Sample 1: DMSO dissolved Ethyl acetate extract *Scutellaria discolor*
Sample2: DMSO dissolved Chloroform extract *Scutellaria discolor*
Sample3: DMSO dissolved n- butanol extract *Scutellaria discolor*

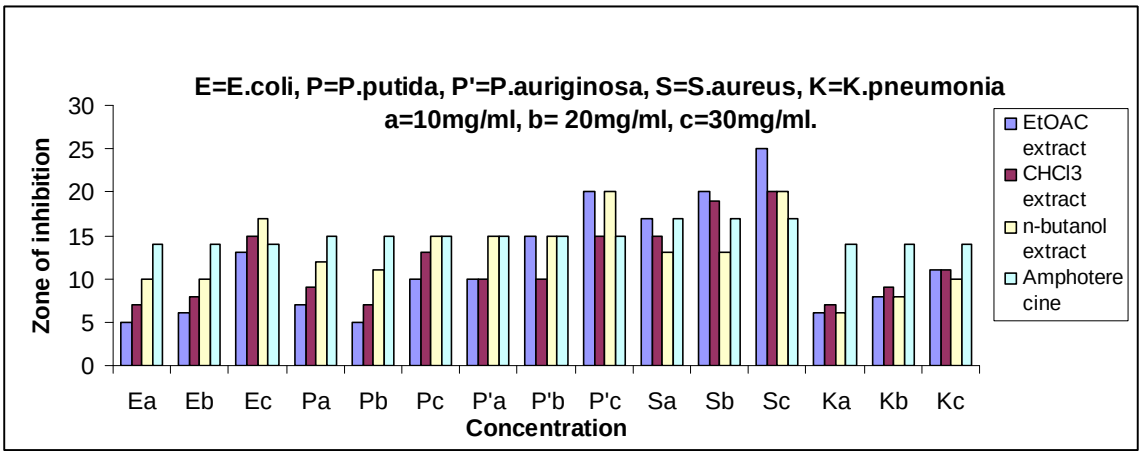

Fig. B.I. Antibacterial activity of ethyl acetate, chloroform and n- butanol extracts of *Scutellaria discolor* against *E.coli, P.putida, P.auriginosa, S.aureus* and *K. pneumoniae*.

Table. B.II. Antifungal activity (zone of inhibition) of crude extracts and solvent fractions of *Scutellaria discolor(*Colebr*)*

Organisms	***Scutellaria discolor*(10, 20,30 mg/ml)**				
	concentration mg/ml	**Sample 1 (mm)**	**Sample 2 (mm)**	**Sample 3 (mm)**	**Control (mm)**
Aspergilus flavus	10	5±0.44	7±0.51	6±0.44	20±0.89
	20	7±0.51	10±0.63	8±0.57	20±0.89
	30	10±0.63	12±0.69	10±0.63	20±0.89
Aspergilus niger	10	10±0.63	12±0.69	7±0.51	25±1.0
	20	10±0.63	14±0.75	10±0.63	25±1.0
	30	15±0.77	16±0.80	12±0.69	25±1.0
Aspergilus fumigatus	10	7±0.51	7±0.51	7±0.51	20±0.89
	20	9±0.59	9±0.59	9±0.59	20±0.89
	30	13±0.72	11±0.65	13±0.72	20±0.89
Candida albicans	10	10±0.63	15±0.77	10±0.63	25±1.0
	20	15±0.77	19±0.87	15±0.77	25±1.0
	30	15±0.77	20±0.89	15±0.77	25±1.0
Microsporum gypsum	10	6±0.44	20±0.89	15±0.77	25±1.0
	20	8±0.56	20±0.89	15±0.77	25±1.0
	30	12±0.69	30±1.09	20±0.89	25±1.0

Values are expressed as mean ± SEM; n = 3 in replicate for each treatment.
Sample 1: DMSO dissolved in Ethyl acetate extract of *Scutellaria discolor*
Sample 2: DMSO dissolved in Chloroform extract of *Scutellaria discolor*
Sample 3: DMSO dissolved in n- butanol extract *of Scutellaria discolor*

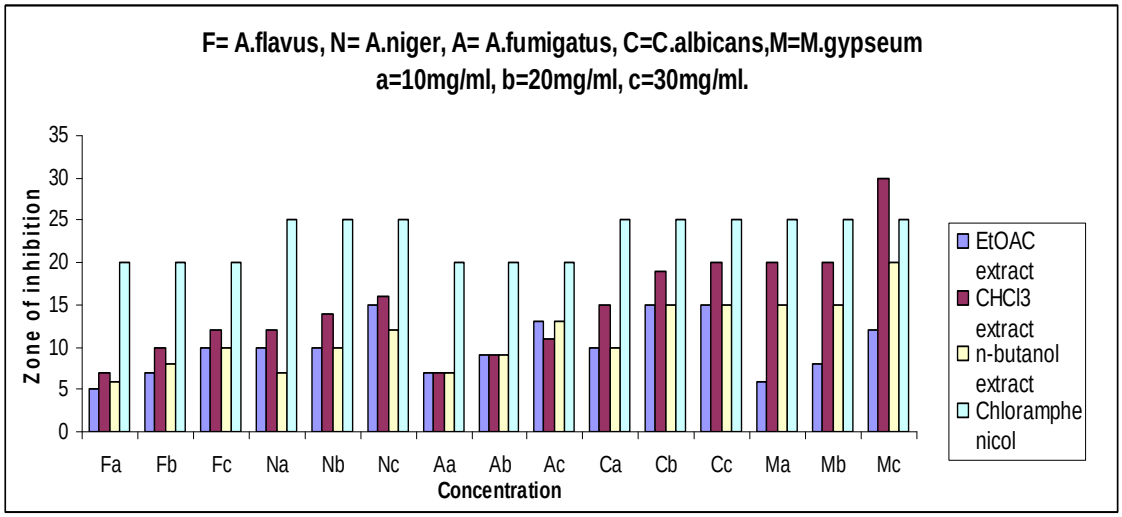

Fig. B.II. Antifungal activity of ethyl acetate, chloroform and n- butanol extracts of *Scutellaria discolor* with control against *A.flavus, A. niger, A.fumigatus, C.albicans and M.gypseum.*

CONCLUSION

The present finding explored the felt need work of confirmation in proofing the elites of traditional knowledge of health care system that practices since immemorial time through the modern hi-tech, therapeutic researches with broad based outlook knowledge for better health of mankind on earth.

The potent of bioactive in the extracts of *Scutellaria discolor* in elimination of bacterial microbes enact selectively and thereof required to adjustment in management of diseases with associated microbes. The ethyl acetate extract of *Scutellaria discolor* has high degree inhibition of bacterial growth to *P.auriginosa* and *S. aureus* only at higher concentration while chloroform extract acts the antibacterial activity to *Staphylococcus aureus* only at higher concentration and n-butanol extract have the potential to suppress to *E. coli*, *P. auriginosa* and *S. aureus* but no action to *P. putida*.

The bioactive activity of the ethyl acetate extract have no significant antifungal potential in fungal species viz. *A. flavus, A. fumigatus, M. gypseum, A. niger* and *C.albicans* while Chloroform extract have best antifungal activity to *M. gypseum* at high concentration but no significant impact to *A. niger, C. albicans, A. flavus* and *A. fumigatus* and no significant antifungal activity on *A.flavus, A. niger, A. fumigatus; C. albicans* and *M. gypseum* by n-butanol extract.

REFERENCES

1. Anonymous (2008). http:// en.wikepedia.org/wiki/scutellaria.

2. Hewitt, W. Vincent, S. Theory and application of microbiological assay. Academic Press, 1989; London.

3. Ellof, J.N. A sensitive and quick microplate method to determine the Minimum Inhibitory Concentration of plant extract for bacteria. *Planta Medica.*, 1998; 64: 711-714.

4. Qadrie Z.L., Jacob B. Anandan, R. Ralkapur B. Ulla M.R. Antibacterial activity of ethanol extract of Indoneesiella Echioides (L) Nees. Evaluated by filter paper disc method. *Pak. J. Phar. Sc.* 2007 ; 22: 123-125.

5. Irobi ON, Young M, Daramola SD. Antimicrobial activity of Annato Bixoovellana Extra International *J. of Pharmacognosy*, 1996; 34: 87-90.

6. Anonymous, Pharmacopia of india (The India Pharmacopia) 3rd Edition, Govt. of India, New Delhi, Ministry of Health and Family welfare, 1996.

7. Okwu, D. E. Phytochemical, vitamin and mineral contents of two Nigerian medicinal plants. *J. Mol. Med. Adv. Sc*., 2005, 1: 378- 381.

8. Duke, J. Handbook of biological active phytochemicals and their activities. BOCA Raton (FL) CRC Press, 1992, Pp: 99-131.
9. Salah, W. N. J.; Miller, G.; Pagauga, G.; Tijbug, A. P.; Bolwel, E. Rice and Evans, C. prlyphenolic flavonis as scavenger of aqueous phase radicals as chain breaking oxidant. Arch. Biochem. Biorch, 1995, 2: 339-346.
10. Okwu, D. E. Phytochemical and vitamin content of indigenous species of south eastern Nigeria., *J. Sustain Agric. Environ*. 2004, 6: 30-34.
11. Kensella, J.E. *Food Technology*. 1993, 47: 85-90.
12. Trease, E. and Evans, W. C. Textbook of pharmacognosy, 13th edition, Baelliere Tindall, London, 1989, 61-62.
13. Finar, I. L. Organic chemistry: stereochemistry and the chemistry of natural products, 1989, .5th Edition. Vol. 12: Longman Group, UK. 517- 605.
14. Singh, S.R. and Devi, M.Neshwari. Nicotine, saponin and purine from therapeutic *Melothria purpusilla* (Blume) Cong a well known home remedy herbal for humankind. *J. of Curr. Sci.* 2007, 10(1): 357-362.
15. Awosika, F. Local Medicinal Plants and Health of Consumers Cli. Pharm. *Herbal Medicine*, 1991, 9: Pp. 28 –29.
16. Akiyama, H.; Kazuyasu, F.; Yamasaki, O.; Oono T. and Iwatsuki, K. Antibacterial action of several tannins against Staphylococcus naureus. *Journal of antimicrobialchemotherapy* , 2001, 48: 487 – 49.
17. Morton, J. *Purple mombin fruits of warm climates*, Miami Publishers New York, 1987, Pp: 245.
18. Haslam, E. 1996, *J. Nat. Product* 59: 205-215.
19. Hagerman, A. E. and Klucher, K. M. Tannin-Protein Interaction. In plant flavonoids in biology and medicine biochemical, pharmacological and structure activity relationships, Ed. Cody V. Middleton, E. Jr.; Harbone, J. and Alan, B. Liss, New York, 1986, Pp 67- 76.
20. Singh, S.R. and Devi, M. Neshwari. Antioxidant Phytochemicals and mineral contents of therapeutic plant *Croton caudatus* (Giescler) for humankind *Ind. J. of Env. & Ecoplan* 2010, 17(1-2) : 219-226.
21. Roberts, K.M.; Daryl, K.G.; Peter, A.M. and Victor W.K. *Harper's biochemistry*, 25th edition Large Medicinal Book. 2000, Pp. 209 -210.
22. Ganong, W.F. Review of Medical Physiology. 19th edition. Lange Medical Publications, Stamford, Connecticut, U. S. A. 1999, 318 – 339.
23. Claude, B. and Paule, S. *The manual of Natural living.* 1 Ed. Biddles Ltd., Guildford, Surrey, 1979, Pp: 98-101.
24. Elizabeth Kafaru, Immense help from nature's workshop. 1 Ed. Elikaf Health Services Ltd., 1994, Pp: 207-209.
25. Schrauzer, G.N. Biochemical of the essential ultratrace elements, E. Frieden (ed), Plenum press, New York, 1984, 17.
26. Schroeder, H.A. Role of trace elements in cardiovascular disease. *Med. Clin*. (Ed), 1974.
27. Davis, P.N.; Norris, L.C. and Rratzer F. H. Interference of soybean meal with utilization of trace minerals. *Nutr.* 1962. 77.
28. Watts, D.L. The nutritional relationships of the thyroid. *J. Orthomol. Med*. 1989, 4:3.
29. Failla, M.L. (1986). Hormonal regulation of manganese. *Manganese in Metabolism and Enzyme Function.* Eds. Academic Press, N.Y.
30. Prasad, A.S. Trace Elements and Iron in Human Metabolism. Plenum Pub., N.Y. 1978.
31. Leach, R.M. Jr. Metabolism and function of manganese. In: Trace Elements in Human Health and Disease. Vol. III. Prasad, A. S., Ed. Academic Press, N.Y. 1976.
32. Doisy C.A. Jr: Micronutrient control onbiosynthesis of clotting proteins and cholesterol. In: *Trace Substances in Environmental Health VI.* Hemphill, D.D., *et al.*, Univ. Mo. Press, Columbia 1973.
33. Chandra, S.V. Neurological consequences of manganese imbalance. In: Neurobiology of the Trace Elements. 1983, Vol. *2.* Dreosti, I. E.; Smith, R.M.; Eds. Humana Press.
34. Sanni, S. Pharmacological and Toxicological effects of *Olimum Basilicum* Linn. Aqueous extract in rats. PhD thesis, Usman Danfodiyo University Sokoto. 2007, P. 16.
35. Ahmad, M.; Aktar, M. S.; Malik, T. and Gilani, A.H. Hypoglycaemic action of the flavonoids fraction of Cuminum seeds. *Phytotherap. Res.* 2000, 14: 103-106.
36. Rani, S.A. and Murty, S.U. Antifungal potential of flower head extract of Spilenthus acmella Lin. *Afr. J. Biomed. Res*. 2006, 9: 67-69.
37. Bhalodia, N. R.; Nariya, P. B. and Shukla, V. J. Antibacterial and antifungal activity from flower extracts of Cassia fistula, L. An ethnomedicinal plant. *International Journal of pharm. Tech Research*. 2011, 3(1): 160-168.

38. Odeloye, O.; Akinpelu, A. and Obafami, O. Studies on antimicrobial and phytotochemical analysis of Urena lobata leave extract. *J. of Physical and natural science*. 2007, **1**(2). 1-9.
39. Singh, S.R. and Devi, M. Neshwari. Antimicrobial activity and phytochemical constituents of fruit and seed of *Zanthoxylum rehtsa* (Roxb) P.C.B. *Indian J. Env.Ecoplan.* 2010, 17(1): 51-58.
40. Devi, M. Neshwari, Singh, S.R. Singh, Kh.B., Khatri, N.C. and Devi, S.I. Antimicrobial activity and tetrahydrofuran from medicine "Sidabiyai". *International Journal of pharm. Tech Research*. 2012 (4) 1561-1569.

*****